**State, ACT, and Common Core Standards Alignment**

**Learning Strategies Reading/writing**

| ***Tennessee Standards***  ***Unit 1 (Check for Understanding unless otherwise designated)*** | **ACT Standards** | **Common Core Standards** | |
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| 3103.3.3 Determine and graph the inverse of a function with and without technology.  3103.3.4 Analyze the effect of changing various parameters on functions and their graphs.  3103.3.5 Graph piece-wise and step functions.  3103.3.11 Describe and articulate the characteristics and parameters of a parent function.  **SPI 3103.3.7** Identify whether a function has an inverse, whether two functions are inverses of each other, and/or explain why their graphs are reflections over the line y = x.  3103.3.8 Solve a three by three system of linear equations algebraically and by using inverse matrices and determinants with and without technology.  3103.3.18 Solve compound inequalities involving disjunction and conjunction and linear inequalities containing absolute values.  3103.3.19 Solve linear programming problems.  **SPI 3103.3.12** Interpret graphs that depict real-world phenomena.  **SPI 3103.3.13** Solve contextual problems using quadratic, rational, radical and exponential equations, finite geometric series or systems of equations. | Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages  Identify the graph of a linear inequality on the number line  Identify characteristics of graphs based on a set of conditions or on a  general equation such as y = ax2 + c  Find solutions to systems of linear equations.  Solve linear inequalities that require reversing the inequality sign  Solve absolute value equations  Identify the graph of a linear inequality on the number line | A-SSE : Interpret the structure of expressions.  F-IF: Understand the concept of a function and use function notation  F-IF: Analyze functions using different representations.  C-GO: Experiment with transformations in the plane.  F-BF: Build new functions from existing functions.  A-REI: Represent and solve equations and inequalities graphically.  A-REI: Solve systems of equations.  N-VM: Perform operations on matrices and use matrices in applications.  A-REI: Solve equations and inequalities in one variable.  F-IF: Interpret functions that arise in applications in terms of the context.  F-IF: Analyze functions using different representations. |
| ***Unit 2 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.3.1 Perform operations on algebraic expressions and justify the procedures  3103.3.21 Factor polynomials using a variety of methods including the factor theorem, synthetic division, long division, sums and differences of cubes, and grouping.  Benchmark 1 (9/27-28)  3103.3.6 Simplify expressions and solve equations containing radicals. | Evaluate algebraic expressions by substituting integers for unknown quantities  Add and subtract simple algebraic expressions  Add, subtract, and multiply polynomials  Factor simple quadratics (e.g., the difference of squares and perfect  square trinomials)\*  Work with squares and square roots | A-APR: Perform arithmetic operations on polynomials  F-IF: Analyze functions using different representations**.**  N-RN: Use properties of rational and irrational numbers  A-SSE: Wrote expressions in equivalent forms to solve problems  A-APR: Rewrite rational expressions.  N-RN: Extend the properties of exponents to rational exponents |
| ***Unit 3 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.2.1 Understand that to solve certain problems and equations, the real number system needs to be extended from real numbers to complex numbers.  3103.2.2 Define and give examples of each of the types of numbers in the complex number system.  3103.2.10 Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers over complex numbers.  3103.2.7 Graph complex numbers in the complex plane and recognize differences and similarities with the graphical representations of real numbers graphed on the number line.  3103.2.9 Find and describe geometrically the absolute value of a complex number.  3103.2.3 Identify and apply properties of complex numbers (including simplification and standard form).  3103.2.4 Add and subtract complex numbers.  3103.2.5 Multiply complex numbers.  3103.2.6 Define and utilize the complex conjugates to write the quotient of two complex numbers in standard form.  3103.2.8 Solve quadratic equations over the complex number system.  3103.2.12 Select and use appropriate methods to make estimations without technology when solving contextual problems.  3103.2.13 Analyze and evaluate contextual situations involving any type of number from the complex number system.  3103.3.7 Solve quadratic equations by factoring, graphing, completing the square, extracting square roots and using the quadratic formula.  3103.3.10 Given a quadratic equation, use the discriminant to determine the nature of the roots.  3103.3.22 Determine the number and possible types of zeros for a polynomial function and find the rational roots.  3103.1.6 Use graphical representations to perform operations on complex numbers.  *Benchmark 2 (11/3-4)* | Exhibit some knowledge of the complex numbers  Exhibit some knowledge of the complex numbers  Multiply two complex numbers    Solve complex arithmetic problems  involving percent of increase or  decrease and problems requiring  integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in  geometry settings)  Locate points on the number line and in the first quadrant  Interpret and use information from graphs  in the coordinate plane  Solve absolute value equations  Exhibit some knowledge of the complex numbers  Exhibit some knowledge of the complex numbers  Exhibit some knowledge of the complex numbers  Multiply two complex numbers  Exhibit some knowledge of the complex numbers  Evaluate quadratic functions, expressed in function notation, at integer values  Analyze and draw conclusions based on  information from graphs in the coordinate plane  Identify solutions to simple quadratic  equations  Solve quadratic equations  Evaluate polynomial functions, expressed in function notation, at  integer values  Analyze and draw conclusions based on  information from graphs in the coordinate  plane | N-CN: Perform arithmetic operations with complex numbers.  N-CN: Represent complex numbers and their operation on the complex plane.  F-LE: Construct and compare linear, quadratic, and exponential models and solve problems  N-CN: Use complex numbers in polynomial identities and equations.  A-REI: Solve equations and inequalities in one variable.  A-SSE: Write expressions in equivalent forms to solve problems.  F-IF: Analyze functions using different representations. |
| ***Unit 4 (Check for Understanding unless otherwise designated)*** |  |  |
| **SPI 3103.3.6** Combine functions (such as  polynomial, rational, radical and absolute  value expressions) by addition, subtraction,  multiplication, division, or by composition and evaluate at specified values of their variables.  3103.3.22 Determine the number and possible types of zeros for a polynomial function and find the rational roots.  3103.3.23 Understand the connection between the roots, zeros, x-intercepts, factors of polynomials, and solutions of polynomial equations.  3103.3.2 Determine the domain of a function represented in either symbolic or graphical form.  3103.3.12 Understand the relationship between real zeros of a function and the x-intercepts of its graph  *Benchmark 3 (2/7-8)* | Evaluate polynomial functions, expressed in function notation, at integer values  Solve problems integrating multiple  algebraic and/or geometric concepts  Apply number properties involving  even/odd numbers and factors/multiples Apply number properties involving  positive/negative numbers  Determine the slope of a line from points or equations | A-SSE: Write expressions in equivalent forms to solve problems.  F-BF: Build a function that models a relationship between two quantities.  A-APR: Understand the relationship between zeros and factors of polynomials.  F-LE: Construct and compare linear, quadratic, and exponential models and solve problems. |
| ***Unit 5 (Check for Understanding unless otherwise designated)*** |  |  |
| **SPI 3103.3.5** Describe the domain and  range of functions and articulate restrictions  imposed either by the operations or by the  contextual situations which the functions  represent.  3103.3.9 Find an equation for a parabola when given its graph or when given its roots.  3103.3.20 Understand the relationships between the equations of conic sections and their graphs.  *Benchmark 4 (3/14-15)* | Recognize special characteristics of  parabolas and circles(e.g., the vertex of a  parabola and the center or radius of a circle) |  |
| ***Unit 6 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.1.7 Use the unit circle to determine the exact value of trigonometric functions for commonly used angles (0°, 30°, 45°, 60°…). | Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles | F-TF: Extend the domain of trigonometric functions using the unit circle.  F-TF: Model periodic phenomena with trigonometric functions.  F-TF: Prove and apply trigonometric identities. |
| ***Unit 7 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.1.8 Understand and describe the inverse relationship between exponential and logarithmic functions.  3103.1.9 Translate the syntax of technology to appropriate mathematical notation for non-linear and transcendental functions.  3103.3.3 Determine and graph the inverse of a function with and without technology.  3103.3.4 Analyze the effect of changing various parameters on functions and their graphs.  3103.3.13 Solve problems using exponential functions requiring the use of logarithms for their solutions.  3103.3.16 Prove basic properties of logarithms using properties of exponents and apply those properties to solve problems.  3103.3.17 Know that the logarithm and exponential functions are inverses and use this information to solve real-world problems.  Benchmark 5 (4/25-26) | Exhibit knowledge of logarithms and geometric sequences  Evaluate polynomial functions, expressed in function notation, at integer values†  Exhibit knowledge of logarithms and geometric sequences  Exhibit knowledge of logarithms and geometric sequences  Exhibit knowledge of logarithms and geometric sequences | F-BF: Build new functions from existing functions.  F-IF: Analyze functions using different representations  F-LE: Construct and compare linear, quadratic, and exponential models and solve problems.  F-LE: Interpret expressions for functions in terms of the situati9n they model. |
| ***Unit 8 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.1.2 Compare and contrast sampling techniques and identify the best technique for a given situation  3103.1.4 Identify the weaknesses of calculators and other technologies in representing non-linear data, such as graphs approaching vertical asymptotes, and use alternative techniques to identify these issues and correctly solve problems.  3103.1.3 Use calculators to identify regression equations for nonlinear data.  3103.1.5 Determine the accuracy and reliability of a mathematical model.  3103.1.9 Translate the syntax of technology to appropriate mathematical notation for non-linear and transcendental functions.  3103.5.5 Calculate measures of central tendency and spread (variance and standard deviation).  3103.5.4 Understand the impact of various sampling methods and use them to draw valid conclusions.  3103.5.10 Design simple experiments to collect data to answer questions of interest.  3103.5.11 Evaluate published data by considering the source, the design of the study and the analysis and representation (or misrepresentation) of the data.  3103.5.12 Investigate bias and the phrasing of questions during data acquisition to formulate reasonable conclusions.  3103.5.1 Collect, represent and describe both linear and non-linear data developed from contextual situations.  3103.5.2 Organize and display data using appropriate methods (including spreadsheets and technology tools) to detect patterns and departures from patterns.  3103.5.3 Read and interpret data from a two-way table.  3103.5.9 Use data to detect patterns.  3103.5.6 Use technology to find the appropriate regression equation for both linear and non-linear data.  3103.5.7 Recognize when the correlation coefficient measures goodness of fit and does not imply causation.  3103.5.8 Know the Empirical Rule for one, two and three standard deviations for a normal distribution.  3103.5.13 Apply both theoretical and experimental probability to analyze the likelihood of an event. | Distinguish between mean, median,  and mode for a list of numbers | S-ID: Summarize, represent, and interpret data on a single count or measurement variable.  S-IC: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.  S-ID: Interpret linear models.  S-ID: Summarize, represent, and interpret data on two categorical and quantitative variables.  N–Q: Reason quantitatively and use units to solve problems.  S-IC: Understand and evaluate random processes underlying statistical experiments.  S-CP: Understand independence and conditional probability and use them to interpret data.  S-CP: use the rules of probability to compute probabilities of compound events in a uniform probability model.  S-MD: Calculate expected values and use them to solve problems.  S-MD: Use probability to evaluate outcomes of decisions. |
| ***Unit 9 (Check for Understanding unless otherwise designated)*** |  |  |
| 3103.3.15 Find the sum of an geometric series whose common ratio, r, is in the interval (-1,1).    3103.3.14 Define and use arithmetic and geometric sequences and series including using sigma and pi notation. | Exhibit knowledge of logarithms and geometric sequences | A-SSE: Write expressions in equivalent forms  to solve problems.  F-BF: Build a function that models a relationship  between two quantities. |